

- Humerus with ectepicondylar and entepicondylar foramen; ribs with uncinatè processes; all the vertebræ with intercentral hypapophyses 4. HATTERIIDÆ.
- Humerus with entepicondylar foramen; ribs without uncinatè processes; no hypapophyses between the dorsal vertebræ. 5. HOMŒOSAURIDÆ.
- b. Nasal opening single. Mandible without coronoid process, the rami united in a solid symphysis; vertebræ feebly biconcave; no hypapophyses between the dorsal vertebræ. Humerus with ectepicondylar foramen or groove 6. RHYNCHOSAURIDÆ.
- B. Jaws toothless. Vertebræ procœlous. Mandible without coronoid process, the rami united in a solid symphysis. Humerus with ectepicondylar foramen 7. SAURANODONTIDÆ.

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XXXI.—*On some new or rare Scottish Entomostraca.* By THOMAS SCOTT, F.L.S., Naturalist to the Fishery Board for Scotland, and ANDREW SCOTT.

[Plates VII. & VIII.]

PARARTOTROGUS, gen. nov. (provisional name).

Anterior and posterior antennæ and mouth-organs as in *Artotrogus*, Boeck, except that the siphon is rudimentary. First pair of swimming-feet with both branches two-jointed;

third pair with both branches three-jointed; fourth pair with outer branch three-, inner branch two-jointed; fifth pair rudimentary.

This genus has been provisionally instituted to include a species closely related to *Artotrogus*, but from which it is at once distinguished by the structure of the swimming-feet and the rudimentary siphon.

Parartotrogus Richardi, sp. n. (Pl. VII. figs. 1-11.)

Length exclusive of tail-setæ .5 millim. Seen from above the first body-segment is subrhomboid, its greatest breadth being equal to about one and an eighth times the length; forehead slightly produced, truncate. Anterior antennæ short, moderately stout, nine-jointed, the second joint considerably longer than any of the others; the formula shows the relative length of the joints—

$$\frac{12-20-6-5-6-10-12-13-14}{1-2-3-4-5-6-7-8-9}$$

The antennæ when bent back upon the body are scarcely half the length of the first segment. Posterior antennæ four-jointed, the third joint nearly twice the length of the preceding one and three times longer than the next; armed with a strong terminal claw, hooked at the apex; a rudimentary one-jointed secondary branch springs from the middle of the second joint. Siphon very small. Mandibles small, stylet-shaped. Maxillæ small, with two one-jointed spiniferous branches, one branch much smaller than the other. Anterior and posterior foot-jaws nearly as in *Artotrogus magniceps*, Brady. Both branches of first pair of swimming-feet two-jointed, the last joint of both branches (but especially of the inner branches) dilated and bearing several plain setæ; (?) third and fourth pairs as in *Lichomolgus fucicolus*, Brady, but more slender and with the marginal and terminal spines broadly dagger-shaped; fifth pair small, bilobed, furnished with a few apical setæ. Ovisacs two, large. No males were observed.

Remarks. Only three pairs of swimming-feet could be observed, even after the most careful dissection of several specimens; it appeared to be the second pair that was wanting, as a considerable hiatus existed between the first pair and the next, much greater than between the fifth and the preceding pair.

This species was first known to us in 1889, having been obtained in material dredged near Fidra Island, Firth of Forth. Since that time it has been occasionally observed

not only in material from the locality named, but also from the "Fluke Hole," off St. Monans. Towards the end of June 1892 a quantity of dredged material from the vicinity of Fidra was being examined, when a specimen carrying two large ovisacs turned up—the only specimen with ovisacs that has been obtained. The discovery of this specimen set at rest to a great extent some doubts entertained by us regarding the maturity of those previously observed.

We have named this species in compliment to M. Jules Richard, of Paris, the eminent zoologist and student of the Entomostraca.

Lichomolgus concinnus, Scott. (Pl. VII. figs. 12–15.)

1892. *Lichomolgus concinnus*, Scott, Tenth Annual Report Fishery Board for Scotland, part iii. p. 261, pl. xi. figs. 25–33.

This species was described (*op. cit.*) from a single specimen, a female, obtained in material dredged off St. Monans, Firth of Forth, in the early part of last year.

Some time ago a specimen of *Doris* (?) *tuberculatus* was taken in the neighbourhood of Granton; and while it was being examined several copepod parasites were accidentally observed in the vicinity of the branchial appendages; the thorax of the copepods was of pale whitish colour, but they were otherwise nearly transparent and were almost undistinguishable from their surroundings.

A careful examination of some of the specimens showed that the *Doris* parasite agreed with *Lichomolgus concinnus* in all respects except that the distal angles of the fifth feet were acute instead of being rounded, and that the abdomen was slightly longer than is shown in the figure in the Fishery Board's Report; but these differences, which might be due to local causes, are comparatively unimportant.

No other specimen of the same species of *Doris* has since been obtained; we are therefore unable to say whether this *Lichomolgus* is commonly associated with the *Doris* or not, but its strongly clawed posterior antennæ and foot-jaws seem to indicate that it is at least semiparasitic in its habits, and it would be of some interest to know if it was confined to any particular species of *Doris*.

The St. Monans specimen, from which the species was described, may have become detached from some *Doris* during the operation of dredging.

MORARIA *, gen. nov. (provisional name).

Somewhat like *Cylindropsyllus*, Brady, in general form and structure, but the posterior foot-jaws are three-jointed; the outer branches of the fourth pair of swimming-feet in the female are similar to those of the second and third pairs, and the fifth pair are two-branched and nearly as in *Attheyella cryptorum*, Brady.

This genus is instituted, provisionally, to include an interesting Harpactid from Loch Morar, Argyleshire, having characters connecting the freshwater species *Attheyella cryptorum*, Brady, with the marine *Cylindropsyllus laevis*, Brady.

Moraria Anderson-Smithi, sp. n. (Pl. VIII. figs. 1-14.)

Female.—Length exclusive of tail-setæ .62 millim. ($\frac{1}{16}$ inch). Body elongate-cylindrical. Anterior antennæ short, moderately stout, seven-jointed; the upper distal angle of the fourth joint is strongly produced, and forms the base of a stout olfactory appendage; the last joint is rather longer than any of the others. The relative length of the joints is shown in the formula—

$$\begin{array}{cccccccc} 6 & - & 8 & - & 6 & - & 5 & - & 5 & - & 7 & - & 10 \\ \hline 1 & - & 2 & - & 3 & - & 4 & - & 5 & - & 6 & - & 7 \end{array}$$

Posterior antennæ (fig. 5) small, three-jointed; a small one-jointed secondary branch, with a few small apical setæ, springs from the middle of the second joint. Mandibles with a moderately broad biting part, armed with five cylindrical teeth and a small seta; palp small, composed of a single two-jointed branch. Maxillæ simple; primary branch broadly truncate, with five moderately large apical spines; secondary appendage bilobed; the exterior and larger lobe bears a stout terminal spine, plumose on the distal half; the smaller lobe terminates in a plain spiniform seta. Anterior foot-jaws (fig. 8) short, stout, furnished with a terminal claw-like spine and two marginal processes, each process terminating in a moderately stout spine, and a curved spine-like seta plumose on the inner edge. Posterior foot-jaws three-jointed, the last joint being very short, and armed with a long terminal claw; the proximal half of the inner margin of the second joint is furnished with several short setæ; a stout, setiferous, spiniform appendage springs from the inner distal angle of the first joint. Outer branches of the first four pairs of swimming-

* From Loch Morar, Argyleshire.

feet three-jointed, inner branches two-jointed; both branches of the first pair are of nearly equal length; the other three pairs, which are nearly alike, have the inner branches considerably shorter than the outer; all the branches are sparingly setiferous, but the terminal and lateral spines are elongate and taper gradually from a moderately broad base to the sharp-pointed apex; the inner branches of the first pair are furnished with a very long subapical seta in addition to the terminal spine. Fifth pair small, two-branched, nearly as in *Attheyella cryptorum*, Brady, but the terminal and marginal setæ are shorter and spiniform (fig. 13). The abdomen consists of four segments, but the first is composed of two segments coalesced. Caudal stylets about as long as the last abdominal segment. Operculum small, subconical, apex acuminate.

The male differs little from the female except in the form of the anterior antennæ, which are hinged and somewhat dilated; the upper margin of the third joint is produced near the middle into a small lobe-like process, which forms the base of a curved spiniform seta; a sensory filament springs from the upper distal angle of the same joint. A stout conical process with a slightly hooked extremity arises from the proximal half and extends somewhat beyond the end of the first joint of the inner branches of the second pair of swimming-feet. The principal branch of the fifth pair is broadly truncate at the apex and provided with two short, stout, terminal spines; the small secondary branch bears an elongate setiferous terminal spine and two setæ on the inner and outer margins. The male abdomen consists of five segments.

Hab. Loch Morar (a freshwater loch in Argyleshire), in material dredged in shallow water at the head of the loch and also to the west of South Tarbet; specimens were more frequent in material from the latter place than from the former.

This species is named in compliment to Mr. W. Anderson-Smith, one of the directors of the Fishery Board for Scotland, who, by his pen and otherwise, has done much to encourage the study of natural history in Scotland.

Note.—Besides *Moraria Anderson-Smithi*, now described, several other interesting Entomostraca were observed in the material from Loch Morar, two of which may be specially mentioned here, viz. :—*Cyclops Ewarti*, Brady, first described by Dr. Brady in the Sixth Annual Report of the Fishery Board for Scotland from specimens obtained in the upper reaches of the Forth in November 1887: this species has not since been observed till now; and its occurrence in Loch

Morar confirms the opinion expressed by Brady, that it had been carried down by some stream into the Forth. *Attheyella cryptorum*, Brady, a species described by Dr. Brady in the 'Journal of Microscopical Science,' 1868, from specimens obtained among the gelatinous algæ on the damp roof of the pit-workings of the low main, West Cramlington Colliery, near Newcastle. No record of any further occurrence of this species has been observed; and it is of some interest to find *Attheyella cryptorum* in the waters of Loch Morar.

Specimens of these two species were sent to Dr. Brady, who confirmed our identification of them.

EXPLANATION OF THE PLATES.

PLATE VII.

Parartotrogus Richardi, gen. et sp. n.

- Fig. 1. Female, dorsal view. $\times 126$.
 Fig. 2. Anterior antenna. $\times 253$.
 Fig. 3. Posterior antenna. $\times 253$.
 Fig. 4. Mandible. $\times 460$.
 Fig. 5. Maxilla. $\times 253$.
 Fig. 6. Anterior foot-jaw. $\times 253$.
 Fig. 7. Posterior foot-jaw. $\times 253$.
 Fig. 8. Foot of first pair. $\times 253$.
 Fig. 9. Foot of ? third pair. $\times 190$.
 Fig. 10. Foot of ? fourth pair. $\times 190$.
 Fig. 11. Abdomen and last thoracic segment. $\times 170$.

Lichomolgus concinnus, Scott.

- Fig. 12. Female, dorsal view. $\times 43$.
 Fig. 13. Posterior foot-jaw, male. $\times 190$.
 Fig. 14. Foot of fifth pair. $\times 380$.
 Fig. 15. Abdomen and last thoracic segment. $\times 190$.

PLATE VIII.

Moraria Anderson-Smithi, gen. et sp. n.

- Fig. 1. Female, dorsal view. $\times 80$.
 Fig. 2. Male, lateral view. $\times 80$.
 Fig. 3. Anterior antenna, female. $\times 380$.
 Fig. 4. Anterior antenna, male. $\times 380$.
 Fig. 5. Posterior antenna. $\times 500$.
 Fig. 6. Mandible and palp. $\times 760$.
 Fig. 7. Maxilla. $\times 760$.
 Fig. 8. Anterior foot-jaw. $\times 760$.
 Fig. 9. Posterior foot-jaw. $\times 760$.
 Fig. 10. Foot of first pair. $\times 760$.
 Fig. 11. Foot of second pair, male. $\times 760$.
 Fig. 12. Foot of fourth pair. $\times 760$.
 Fig. 13. Foot of fifth pair, female. $\times 760$.
 Fig. 14. Foot of fifth pair, male. $\times 760$.